REMARKS

Following entry of the above amendment, claims 1-53 and 74-99 will be pending. Of these, claims 3, 7-10, 13-18, 24, 26-29, 39-42, 46, and 51 stand withdrawn from consideration. Claims 54-73 have been canceled. Claims 1, 36, and 47 have been amended to clarify their distinctions over the prior art. Claims 12 and 45 have been amended to be consistent with the amendments to claims 1 and 36, respectively. Claims 11, 30, 48, and 50 have been amended for clarity, and/or to render moot objections to the claims. Claims 74-99 have been added.

Substitute Declaration

A substitute declaration is submitted herewith, correcting the incorrect provisional application serial number included in the original declaration. This serial number was correctly provided in the first sentence of the application as filed, and was only incorrect in the declaration. Correction is requested of the USPTO's records to reflect the correct provisional application from which priority is claimed. Acknowledgment of the claim to priority under 35 USC 119(e) is also requested.

Claim Objections

Claims 11 and 30 stand objected to. In response, claim 11 has been amended to change "another side" to "a second side," as well as to make other changes of form, to hopefully make the claim more clear, without changing its scope. Claim 30 has been amended to change "a second end portions" to "a second end portion." In view of these amendments, withdrawal of the objections is respectfully requested.

Prior Art Rejections

Kantor

Claims 1, 2, 4, 11, 34, 36-38, 43, 44, and 47-49 stand rejected under 35 USC 102(b) as anticipated by Kantor, U.S. Patent No. 4,546,649 ("Kantor"). Withdrawal of the rejections is respectfully requested for at least the following reasons.

Kantor discloses a thin-wall submersed-tube fluid transportation system that is referred to as an "equiduct" system. Kantor's "equiduct" is a conduit for transporting fluids, e.g., fluid wastes from industrial or municipal processes, "while submerged in and in equilibrium with a liquid body such as river, sea or lake." Col. 1, lines 24-27. Kantor discloses equiducts constructed from a very flexible material, which serves to provide only a separation of the contents from the surrounding water and is operated at a pressure slightly above that of the surrounding medium to maintain the prescribed shape. The equiduct is monitored at a sequence of stations using strain gages attached directly to the wall of the "equiduct" and with a variety of sensors at or near these same stations. Figure 3 of Kantor shows strain gauges 64-67 secured to an outside wall of the equiduct. Kantor mentions the possibility of pressure measurement using the strain gages, stating that such a measurement may be "useful over short time spans." *See* col. 3, lines 1-18. Long-term pressure measurements of pressure in Kantor's equiduct would be impractical due to bending caused by flow within the river or other body of water. Kantor does not disclose use of a sensing tube partially or fully within a separate housing.

Claim 1 as amended recites a pressure transducer that includes *inter alia*, a sensing tube, at least one strain gage on the sensing tube for measuring deformation, and a housing at least partially surrounding the sensing tube. As noted in the application, such a housing may serve a variety of purposes. It prevents external loads (such as bending or twisting) from being transmitted to the sensing tube, thus preventing damage to the sensing tube and preventing the external loads from affecting output of the device. Page 13, lines 10-16. In addition, the housing may protect the sensing tube from other possible sources of damage, may protect strain gages and wire leads from damage, and/or may contain ruptures of the sensing tube. Page 13, lines 17-27. Kantor does not teach or suggest providing such a housing, and provides no cognizance of the advantages of such a housing. Thus claims 1, 2, 4, 11, and 34 are patentable over Kantor.

Independent claims 36 and 47 as amended also recite a housing. Kantor's failure to teach or suggest such a housing also makes claims 36-38, 43, 44, and 47-49 patentable over Kantor.

In addition, dependent claim 49, which recites placing strain gages in a bridge configuration to increase an output signal, is patentable over Kantor for the additional reason that Kantor does not teach or suggest its recited feature. Kantor discusses placing strain gages 64-67 is four different orientations: strain gage 65 essentially perpendicular to the axis of the equiduct 32; strain gage 66 essentially parallel to the equiduct axis; and strain gages 64 and 67 at 45-degree angles to the gages 65 and 66, in different directions. Col. 20, lines 31-38; Fig. 3. Kantor discloses that the gages 64-67 are useful for detecting the "snaking" modes of deformation and passage of surface waves, col 20, lines 38-54, but does not teach or suggest measuring pressure or coupling strain gages in a bridge configuration. Kantor does not involve determining pressure using strain gages, and Kantor does indicate any reason for coupling gages in a bridge configuration or otherwise combining their outputs. Since Kantor does not teach or suggest the feature of dependent claim 49, for an additional reason claim 49 is patentable over Kantor.

Combination of Kantor and Gysling

Claims 5, 6, 12, 19-23, 25, 30-33, 35, 45, 50, 52, and 53 stand rejected under 35 USC 103(a) as unpatentable over Kantor in view of Gysling et al., U.S. Patent No. 6,354,147 ("Gysling"). Withdrawal of the rejections is respectfully requested for at least the following reasons.

Gysling discloses a fluid parameter measurement system that includes a pipe 12, apparently of uniform thickness, with pressure sensors 14, 16, and 18 thereupon. Fig. 1; col. 5, lines 50-67. According to one embodiment, an isolation sleeve 410 is attached to the outer surface of the pipe 12 over where pressure sensors are located. Fig. 17; col. 15, lines 18-32. Gysling discloses that the sleeve 410 forms a closed chamber 412 that may be filled with a gas so that the acoustic energy in the pipe is not

acoustically coupled to fluids and materials outside of the pipe 12, and so that the pressure sensors 14, 16, and 18 may be better calibrated. *Id.* Gysling mentions use of strain gages to measure hoop strains and thereby determine pressure. Col. 3, lines 23-31; col. 19, lines 26-40; Figs. 29 and 30. Gysling does not disclose use with a variable-thickness sensor tube, does not disclose use of strain gages to measure axial strain, and does not disclose use of strain gages in a bridge configuration.

As discussed above, independent claims 1, 36, and 47 as amended are patentable over Kantor because Kantor does not teach or suggest a housing at least partially surrounding a sensing tube. Gysling does not make up for this deficiency, as least because it would not have been obvious to make the proposed modification to Kantor's structure. The proposed modification of Kantor's equiduct structure to include Gysling's isolation sleeve would be impractical, to say the least, and would make Kantor's structure unsuitable for its stated objective.

Modifying Kantor's structure to provide a sleeve over only part of the equiduct would not be obvious because: 1) to do so would require an attachment of the sleeve that is not taught or suggested by either Kantor or Gysling; 2) Kantor's equiduct structure would not support such an attachment; 3) the proposed modification would still leave other portions of Kantor's equiduct vulnerable to rupture; and 4) putting a sleeve over parts of Kantor's equiduct could lead to changes in the shape of the equiduct, changes in readings from Kantor's strain gages, and/or increased chance of equiduct rupture within the sleeve. Kantor's equiduct structure has thin, flexible walls, in order to make the tubes relative inexpensive and easy to install. First, there is no teaching or suggestion from either Kantor or Gysling as to how a sleeve could be attached to only part of such a thin, flexible tube.

Second, the flexible equiduct itself would clearly be unable to support attachment of any sort of substantial structure, since any sort of structure attached to the equiduct would itself increase stresses on the equiduct, and thus would tend to cause rupture of the equiduct. Rather than providing any sort of increased safety, the proposed modification would likely lead to creation of locations of increased system vulnerability.

Third, what would be the point of attaching a sleeve to only part of the equiduct? According to the Action, it would be to "provide safety to the electronics and other components." But attaching a sleeve to only part of the equiduct would still leave other portions of the equiduct vulnerable to rupture. Since any rupture of the equiduct would be likely to be more of a significant loss than exposure of equipment like strain gages and wires to the environment, there would be no point in enclosing only part of the equiduct.

Fourth, putting Gysling's sleeve only over part of Kantor's equiduct would lead to changes in the workings of Kantor's device. Gysling's sleeve 412 makes a closed chamber which isolates a tube portion from the external environment. Kantor's equiduct is designed to be located in a pressurized environment such as "near the bottom of a water artery such as a river," with the equiduct "in fluid equilibrium with the surrounding water." Kantor, Abstract. Isolating a portion of Kantor's tube would lead to a different pressure environment in the isolated portion. This would change the shape of the isolated portion of the equiduct, resulting in changes in readings of Kantor's strain gages. This different pressure environment could also increase chances of a rupture of the portion of the equiduct within the sleeve, since the portion within the sleeve could have a higher pressure difference across the walls of the equiduct.

So enclosing part of the Kantor's equiduct in Gysling's sleeve would be impractical or hazardous to the system. What then of the possibility of enclosing all of Kantor's equiduct within a sleeve? Such a modification is not suggested because to do so would completely destroy the character of Kantor's system as a flexible tube that is "relatively inexpensive and easy to install." Moreover, there is no suggestion in either reference for full enclosure of a tube. Further, such a proposed modification involves operating the equiduct in a non-uniform pressure, the drawbacks of which were discussed in the previous paragraph. Thus a proposed combination that would involve enclosing all of Kantor's equiduct in a sleeve is also not suggested.

Because the proposed modification would not be obvious, claims 5, 6, 12, 19-23, 25, 30-33, 35, 45, 50, 52, and 53 are patentable over Kantor and Gysling.

In addition, some the dependent claims recite additional features not taught or suggested by Kantor and Gysling. Claim 21 recites that an end portion of a sensing tube has a thicker wall than a central portion of the sensing tube. The Action states that this "would be obvious to a skilled individual," but the plain fact is that there has been no teaching or suggestion shown of such a variable-thickness sensing tube within a housing. Certainly it would have not been obvious to provide variable thickness for Kantor's thin, flexible equiduct. Likewise, there has been no showing that it would not have been obvious to provide the sensing tube with a curved portion (claim 22), with the curved portion possibly having a constant radius of curvature (claim 23), and/or with at least strain gage adjacent the curved portion (claim 25). These features are not obvious – advantages of these features are discussed at length in the application. *See* page 17, line 17 - page 18, line 6. As discussed there, advantages include concentration of strains to facilitate strain measurement, avoidance of stress concentrations that may lead to cracks or fracture of the sensing tube, and facilitating installation of the sensing tube. Kantor and Gysling show no cognizance of the recited features or the advantages they might bring. If these features are still considered obvious, a showing should be made of a teaching or suggestion of them. Absent such a showing, claims 21-23 and 25 are patentable over Kantor and Gysling, either alone or in combination.

Further, neither Kantor nor Gysling teach or suggest connecting together strain gages in a bridge configuration, as is recited by dependent claim 33. As discussed above with regard to claim 49, Kantor does not teach or suggest connecting together strain gages in a bridge configuration. Gysling's strain gages are located at different locations to measure different dynamic pressures at those locations. Gysling does not teach or suggest coupling the strain gages in a bridge configuration, nor would such a modification of Gysling be appropriate, given that different pressures are measured at the different locations. Therefore Gysling does not provide what Kantor lacks with regard to strain gages in a bridge configuration, and thus claim 33 is patentable over Kantor and Gysling, either alone or in combination.

It also would not be obvious to modify Kantor's equiduct to include a thinner portion that amplifies changes in shape, as is recited in dependent claim 35. Kantor's equiduct is thin and flexible already. Further thinning a section of it would cause bulging in the thinner section that might lead to rupture. Nothing in Gysling teaches or suggests a variable thickness in its pipe 12, either. Thus dependent claim 35 is patentable over Kantor and Gysling, either alone or in combination.

Newly-Added Claims

All of the newly-added claims 74-99 are believed to read upon elected species.

Independent claims 74, 83, and 92 all recite, in one form or another, strain gages in a bridge configuration. As discussed above with regard to claims 33 and 49, neither Kantor nor Gysling teach or suggest such a feature. Therefore claims 74-94 are patentable over Kantor and Gysling, either alone or in combination.

New dependent claims 95 and 96 depend directly or indirectly upon claim 1, and is patentable for at least the reasons given above for the patentability of claim 1. In addition, claim 95 is patentable over Kantor and Gysling for the additional reason that neither Kantor nor Gysling teach or suggest a housing that transmits external loads between pipe segments to which it is mechanically coupled.

New dependent claims 97-99 depend directly or indirectly upon claim 22, and are patentable for at least the reasons given above for the patentability of claim 22. In addition, claims 97-99 are patentable over Kantor and Gysling for the additional reasons that Kantor and Gysling do not teach or suggest the recited locations of strain gages (claims 97 and 98), and Kantor and Gysling do not teach or suggest strain gages in a bridge configuration (claim 99).

Conclusion

In view of the foregoing, withdrawal of the rejections and objections is respectfully requested, in which case the application would be in condition for allowance.

Should the Examiner believe that a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Authorization is given to charge **$307.00** to Deposit Account No. 18-0988 (Charge No. KICHP102USA) for a two-month extension of time, and for the presentation of new and/or amended claims. In the event any additional fees are due in connection with the filing of this paper, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 (Charge No. KICHP102USA).

Respectfully submitted,
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